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Review

Physical therapy role for COVID 19 patients

Physical therapy for patient with Covid 19

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Abstract
Physiotherapy is a longtime profession throughout the globe. Globally, physiotherapists typically work in acute hospital wards and ICUs. Above all, cardiorespiratory physical therapy focuses on the management of acute and chronic metabolic process conditions and aims to enhance physical recovery following an acute health problem. This study aims to produce info to physiotherapists and acute care aid facilities regarding the potential role of physical therapy within the management of hospital-admitted patients with confirmed or suspected COVID-19. Physiotherapists who add primary aid facilities are possible to play a task within the management of patients admitted to hospital with confirmed or suspected COVID-19.

Keywords
COVID-19; Physical therapy; Chest physical therapy

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Introduction

Coronavirus 2019 (COVID-19 or SARS-CoV-2) could be a producing virus of an infectious disease involving severe acute respiratory syndrome. The malady was discovered in December 2019 in Wuhan, the capital of Hubei province in China, and has unfolded everywhere on the planet, inflicting the coronavirus pandemic. Fever, cough, and shortness of breath are commonly present and could embody fatigue, muscle pain, diarrhea, pharyngitis, loss of smell, and abdominal pain [1]. Its incubation period is around 5 days, but could vary from 2 to 14 days, however, nearly 97.5 % of individuals can develop symptoms at intervals of 11.5 days [2]. Most cases are mild but some develop in to respiratory disease "pneumonia" and multi-organ failure [3]. As of the Gregorian calendar, November 30, 2020, has caused over sixty million cases of COVID-19 and claimed the lives of 1.5 million individuals worldwide. Within the US, over thirteen million cases are reported to the Centers for Disease Control and Prevention (CDC), with over 260,000 deaths [4].

Some Chinese cases manifested solely with chest tightness and palpitations. One study stated that about half of the participants developed a fever at the beginning of their hospitalization, and eighty nine developed a fever later on. Fever and chest troubles appeared later in some older adults and people with other medical conditions [5]. Typically, it progressed to respiratory disease, multi-organ failure, and death [3]. With severe symptoms, the time required from onset to mechanical ventilation is often eight days [5].

The virus is primarily unfolded through shut contact typically by respiratory droplets expelled throughout coughing, sneeze and talking. Shut contact is taken into account being at intervals nearly 1–3 m (3–10 ft) from an infected individual. In March 2020, an editorial argued that the reported droplets distance neglected the results of heat wet outbreath close the droplets and that an uncovered cough or sneeze would travel up to 8.2 meters (27 feet). These droplets typically fall to the bottom or on totally different surfaces, instead of remaining within the air over long distances. During this case, infection occurs mainly by touching a contaminated surface followed by touching the eyes, nose, or mouth [6]. This virus remain infective on surfaces for up to seventy two hours. The foremost contagious amount occurs during the first 3 days once the onset of symptoms, however the transmission could occur before symptoms appear and throughout the malady amount [3].

Not all the small print regarding its transmission area unit glorious [6]. Liquid body substance and spit will have oversized microorganism masses [7]. When speaking loudly, many droplets will be released [8]. A study in Singapore expressed that uncovered cough droplets would travel up to 4.5 meters (15 feet) [9].

Physiotherapy is considered a very important as it prevents the adverse effects of prolonged bed rest and mechanical ventilation. Rehabilitation is carried out in accordance with the wishes of the patient and depends on the amount of consciousness, psychological and physical parameters of the patient. It includes any active and passive therapy that promotes movement. The role of the ICU physical therapist can continue throughout the COVID-19 pandemic, so this paper aims to:

- Give information's on the COVID-19 pandemic and it's pathophysiology
- Give an account about the last medical treatment for COVID-19
- Explain the role of physical therapy for the COVID-19 patient
- Clarify the benefits of chest physical therapy for the COVID-19 patient [40].

Pathophysiology

The lungs area unit is the foremost target organ as a result of the virus infections of the host cells via the enzyme angiotensin-converting enzyme 2 (ACE2), particularly on type II alveolar cells of the lungs [10]. The density of ACE2 within the tissue matches the severity of its effects, and it was absolutely steered that decreasing ACE2 activity may be protecting [11,12], however this has not tested [13].Thus, with malady progression, respiratory failure and death could occur [12]. Autopsies of infected cases showed diffuse alveolar damage (DAD), and lymphocyte-containing inflammatory infiltrates in the lungs [14].

The virus conjointly affects gastrointestinal organs [15], endothelial tissue cells and enterocytes [16]. ACE2 may be found within the brain, thus infection will cause neurological manifestations like loss of smell, headaches, nausea and vomiting. Encephalopathy can also occur [17]. The virus will harm the circulatory system [5], which has been ascertained in 12% of infected people in Wuhan, China [18], and has been noted in many severe cases [19]. This injury can also be associated with ACE2 receptors within the heart [20]. An increased incidence of thrombosis (31%) and venous thromboembolism (25%) was ascertained in critical care unit patients with the malady [20,21]. The virus conjointly infects kidney cells, causing acute kidney injury, a standard complication and reason for death, particularly in patients with compromised kidney function [22].

There are four forms of pneumonia severity [14]:

• Minor pneumonia: minor serous exudation and minor fibrin exudation.

• Mild pneumonia: pulmonary edema, pneumocyte hyperplasia, large atypical pneumocytes, interstitial inflammation with lymphocytic infiltration and multinucleated giant cell formation.

• Severe pneumonia: diffuse alveolar damage (DAD) with diffuse alveolar exudates. DAD causes acute respiratory distress syndrome (ARDS) and severe hypoxemia.

• Healing pneumonia: the formation of exudates in the alveolar cavities and pulmonary interstitial fibrosis.

Not all infected people develop symptoms (asymptomatic carriers). These could contribute to the development of the disease, and their proportion is presently unknown. The Korea Centers for Disease Control and Prevention (KCDC) stated that they represent 20 % of all confirmed cases throughout their hospital stay [23].

Progression

Acute lung injury/acute respiratory distress syndrome (ALI/ARDS) is detected by Murray score (Table 1), the ultimate score is obtained by dividing the collective score by the quantity of the used elements. Zero indicates no respiratory organ injury, 1 - 2.5 indicates mild to moderate injury, and ≥ 2.5 indicates ARDS [24].

Table 1. Murray score [26]

	0	1	2	3	4
Hypoxemia PaO_2/FiO_2	≥300	225 – 299	175 – 224	100 – 174	<100
PEEP (cmH_2O)	≤5	6 – 8	9 – 11	11 – 14	≥15
Compliance (ml/cmH_2O)	≥80	60 – 79	40 – 59	20 – 39	≤19
CXR quadrants infiltrated	0	1	2	3	4

Diagnosis

Real-time reverse transcription-polymerase chain reaction (rRT-PCR) from a nasopharyngeal swab is common. Chest CT might facilitate in people with suspected infection, supported symptoms and risk factors; however, not for routine screening. The World Health Organization (WHO) declared the 2019–2020 coronavirus outbreak a Public Health Emergency of International Concern (PHEIC) on January 30, 2020 and a pandemic on March 11, 2020. Native transmission of the disease has been recorded in most countries across all six WHO regions [25].

Management

1. Prevention

There are several efforts to cut back the number of active cases at any given time, with the infection of "flattening the curve" to permit aid services to rise manage the outbreak. Likewise, increasing aid capability, or "raising the line" will improve management, by increasing bed count, personnel, and instrumentation. Inadequate mitigation may result in a recurrence of the pandemic. Preventive measures embody staying at home, avoiding packed places, washing hands with soap and water for a minimum of twenty seconds, and avoiding touching the eyes, nose or mouth with unwashed hands [26].

The CDC recommends covering the mouth and nose with a tissue or using the inside of the elbow when coughing or sneezing. Correct hand hygiene is needed when coughing or sneezing. In addition, using material protective face covers public places can help, in limiting transmission from symptomless people. Social distancing methods aimed at reducing contact of infected persons with giant teams by closing colleges and workplaces, limiting travel and canceling giant public gatherings. Distancing pointers additionally embody that individuals occupy at least half a dozen feet (1.8 m) apart. Personal hygiene and a healthy lifestyle and diet are counseled to enhance immunity [27].

For medical groups, the CDC recommends using personal protective equipment (PPE): gown, eye protection, respirator or facemask and medical gloves. Once attainable, respirators are most popular. N95 respirators, the sort approved for industrial settings, were approved by the FDA under the Emergency Use Authorization (EUA). Once the masks don't seem to be out there, the CDC recommends using face shields or, as a final resort, do-it-yourself masks. The use of masks is suggested for those with suspected infection and their caregivers, however recommendation on its use by the overall public varies between required use to recommendations against their use [28].

Reusable non-invasive instrumentation should be decontaminated within the following situation: between and once every patient use, once contaminated by blood and body fluid and regularly as part of equipment cleaning. An increased decontamination frequency is to be considered for reusable non-invasive care instrumentation once employed in isolation/cohort areas [27].

2. Medications

No specific treatment or vaccine for COVID-19 has been created out there at this stage. However, the analysis is current [6]. Management is restricted to the treatment of symptoms, supportive care, isolation, and experimental measures. No evidence suggests that NSAIDs worsen COVID-19 symptoms. However, there are some recommendations for using paracetamol (acetaminophen) over ibuprofen. No sufficient information has been found to justify stopping ACE inhibitors and angiotensin receptor blockers. Many immune-based therapies that are expected to switch the course of COVID-19, as well as corticosteroids, are currently under investigation or are already in use. These agents might target the virus (e.g., convalescent plasma) or modulate the reaction (e.g., corticosteroids, interleukin [IL]-1 or IL-6 inhibitors) [29].

The Committee has reviewed unpublished section I/II/III safety and effectuality information of the Pfizer BioNTech mRNA vaccine. The vaccine seems to be safe and well-tolerated, and there have been no clinically regarding safety observations. The information indicates a high effectuality in all age groups (2-16 years and over), as well as encouraging older adults. The Committee advises that this vaccine be employed in the primary section of the program, in keeping with the priority order commenced below. Whereas there is some evidence to point high levels of short-run protection from one dose of vaccine, a two-dose vaccine schedule is presently suggested in accordance with restrictive approval [30].

Low molecular weight heparin improves outcomes in severe COVID-19 with signs of coagulopathy (elevated D-dimer). Validation of care will involve fluid medical aid, oxygen support, and support of different very important organs [31]. Extracorporeal membrane oxygenation (ECMO) has been employed in cases of respiratory failure; however, its advantages are underneath analysis [33,34].

Most COVID-19 cases do not need mechanical ventilation or alternatives [35,36], and intubation is often avoided with a high flow nasal cannula or bi-level positive airway pressure [36]. Some doctors like invasive mechanical ventilation because it limits the unfold of aerosol particles compared to a high flow nasal cannula [35]. Severe cases are undoubtedly common in older adults (≥60 years, and particularly ≥80 years) [36]. One study in China showed that 5% of patients were admitted to medical care units, 2.3% required mechanical support of ventilation, and 1.4% died. Roughly 30% of individuals in hospitals in China with COVID-19 are eventually admitted the unit [33].

Also, the absence of major organ system failure should be considered during weaning from MV as [37]:

1. Optimized cardiovascular function (Arrhythmias, Fluid overload, myocardial contractility).
2. Body temperature: 1º degree will increase carbon dioxide production and O_2 consumption by 5%
3. Normal electrolytes: potassium, magnesium, phosphate and calcium.
4. Adequate nutritional status: underneath or over feeding.
5. Optimized renal, Acid-base, liver and GI functions.

3. Physiotherapy

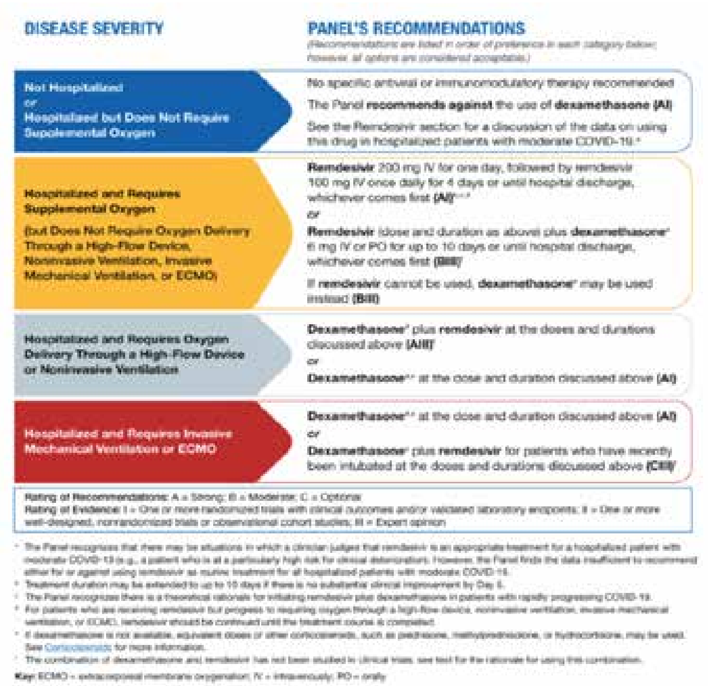

Figure 1. Recommendations for pharmacological management of patients with COVID-19

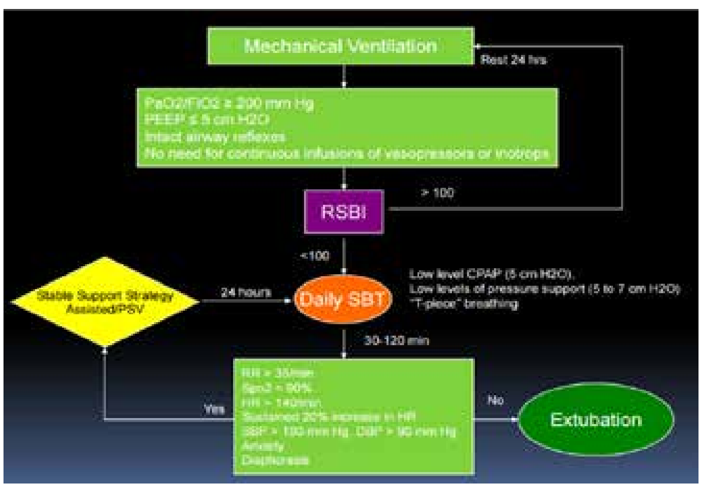

Figure 2. Process of weaning

Table 2. Weaning criteria [35]

Weaning criteria	Guide
1. Adequate oxygenation	PaO2/FIO2 ratio > 200 or FIO2 ≤ .40 and SpO2 ≥ 90% and/or PaO2 ≥ 60
	Peep ≤ 8 cmH20
2. Adequate ventilation	PH ≥ 7.30
	RR ≤ 35 b/m
	VE ≤ 15 L/m
	Inspiratory effort by patient
3. Hemodynamic stability	HR ≤ 120 p/m
	SBP 90 – 150 mmHg
	No or minimal vasopressors or inotropes
4. Appropriate level of consciousness	No continuous sedation infusion
	No neuromuscular blocking agents
5. Temperature	Temp >36° C & < 38° C
6. Adequate hemoglobin	Hb ≥ 70 % and/or no evidence of hemorrhage.
7. Rapid shallow breathing index (RSBI)	60-105

Physiotherapy is considering a very important hindrance of the adverse effects of prolonged bed rest and mechanical ventilation. Rehabilitation is performed according to the wishes of the patients and depends on the level of consciousness, psychological and physical parameters of the patient [38]. It includes any active and passive therapy that promotes movement. The role of ICU physical therapist can continue throughout the COVID-19 pandemic, with the utilization of full PPE whereas operating. High-risk patients might also profit. Physiotherapists could give airway clearance techniques for ventilated patients with insufficient airway clearance and position patients with severe respiratory failure related to COVID-19, using a prone position to optimize oxygenation [39]. As with any contagious respiratory condition, physical therapists and people within the immediate atmosphere of the patient must follow strict protocols and make sure the use of PPE while ideally treating the patient during a single space with the door closed, limiting employee's variety and minimizing entry and exit from the space throughout the treatment. The secretion load of individuals with COVID-19 is low in order that they do not typically need invasive or intensive airway clearance techniques. Physical therapy here is focuses more on non-invasive ventilation support measures than on the rehabilitation section [45].

In the early stages of COVID 19 and respiratory distress, common modalities used are also contraindicated within the acute section (may compromise the high work of breathing). Contraindicated interventions include [40]:

• Diaphragmatic breathing
• Pursed lips breathing
• Bronchial hygiene/ lung re-expansion techniques (PEP Bottle, cough machines, etc.)
• Incentive spirometry
• Manual mobilization techniques or stretching of the skeletal structure
• Nasal washings
• Respiratory muscle training
• Exercise training
• Patient mobilization throughout clinical instability

Goals of physiotherapy in ventilated patients

1- For the acute phase, the program is focused on:

a. Increasing the ventilation and oxygenation:

Positioning techniques: supine, prone and lateral attitude could considerably alter oxygenation. Positioning is significant in the management of the mechanically ventilated COVID-19 patient, with regular turning to optimize ventilation, stop pathology and forestall pressure sores [39]. Positioning includes a lateral positioning and prone positioning, which might be accustomed to treat hypoxemic respiratory failure. Prone ventilation (i.e. ventilation whereas within the prone position) could improve lung mechanics and gas exchange, resulting in enhancements in oxygenation within the majority of patients with ARDS, and might improve outcomes [41]. Prone ventilation has been reported to be effective in hypoxic patients with COVID-19 and will be completed consistent with the hospital pointers that embrace applicable PPE for workers and reduce any adverse events, e.g. accidental extubation and breaking of the circuit.

Prone positioning is usually recommended for a minimum of sixteen hours per day in adults [42].

b. Reduction of the O_2 Consumption

In mild to moderate stages of the disease, usual oxygen support (facemask oxygen) is also advantageous. WHO recommends oxygen supplementation like a shot, with a target SpO_2 > 94%, for patients with respiratory distress, hypoxemia or shock. Patients should still have accumulated work of breathing or hypoxemia even once whereas employing a mask with reservoir bag (flow rates of 10 - 15 L/min, FiO_2 0.60 - 0.95). Nasal cannulas do not seem to be counseled as a they will result in the next spread of droplets [41].

Whereas the use of high-frequency nasal oxygen carries a little risk of aerosol generation, it is a counseled methodology for treatment of hypoxia related to COVID-19, providing the employees are carrying optimum airborne PPE. This may due to the low probability of a transmission mechanism following the use of optimum PPE and different infection management measures. Negative pressure rooms are most well-liked for these patients [41]. Nebulisation is not counseled. If the patient has developed ARDS, noninvasive ventilation (NIV) is generally not recommended and intubation with mechanical ventilation is most preferred, in addition to a prone position to assist ventilation and closed suctioning [39].

2-Early post-acute phase, the rehabilitation program is concentrated on:

a. Reduction of the O_2 Consumption.

b. Improve the secretion clearance.

Upon stabilization of the patient, the main goal in respiratory physiotherapy is to mobilize secretions and ease the work of breathing. This can be done through the techniques such as positioning, deep breathing exercises, autogenic drainage, active cycle of breathing, breath stacking, mobilization and manual techniques (e.g. percussion, vibrations, assisted cough) to help sputum expectoration [45]. Closed inline suction catheters are recommended and imperative to avoid disconnection of the patient from the ventilator to prevent lung decruitment and aerosolization. If needed, clamp the endotracheal tube and disable the ventilator (to prevent aerosolization). Suctioning is to be used as required, though not on regular basis [43].

3-Long term rehabilitation, the rehabilitation program is concentrated on:

a. To prevent and/or correct shortening of soft tissues.

b. Mobility and active daily life.

These include passive, active assisted, active, or resisted joint range of motion exercises to maintain or improve the range of motion, joint integrity, and muscle strength. They typically involve mobilization and rehabilitation (e.g. bed mobility, sitting balance, sitting out of bed, sit to stand, standing hoists, walking, tilt table, upper limb or lower limb ergometry, exercise programs) [45].

Conclusion:

Physical therapy is an effective treatment for patients with COVID-19 as it improves secretion clearance, reduces O_2 consumption, increase oxygenation, and prevents bed ridden complications.

Scientific Responsibility Statement

The authors declare that they are responsible for the article's scientific content including study design, data collection, analysis and interpretation, writing, some of the main line, or all of the preparation and scientific review of the contents and approval of the final version of the article.

Animal and human rights statement

All procedures performed in this study were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards. No animal or human studies were carried out by the authors for this article.

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Conflict of interest

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